TECHNOLOGY DEPARTMENT


# Gas Journal

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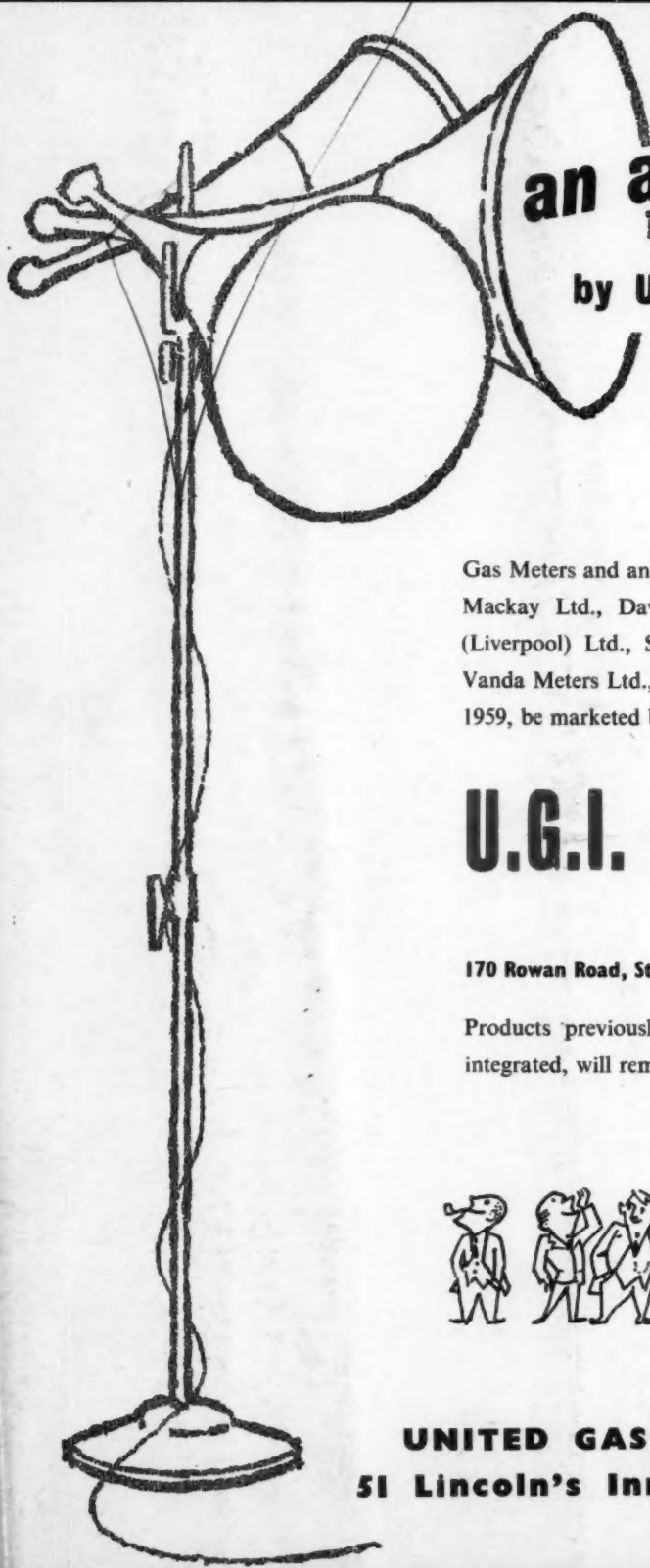


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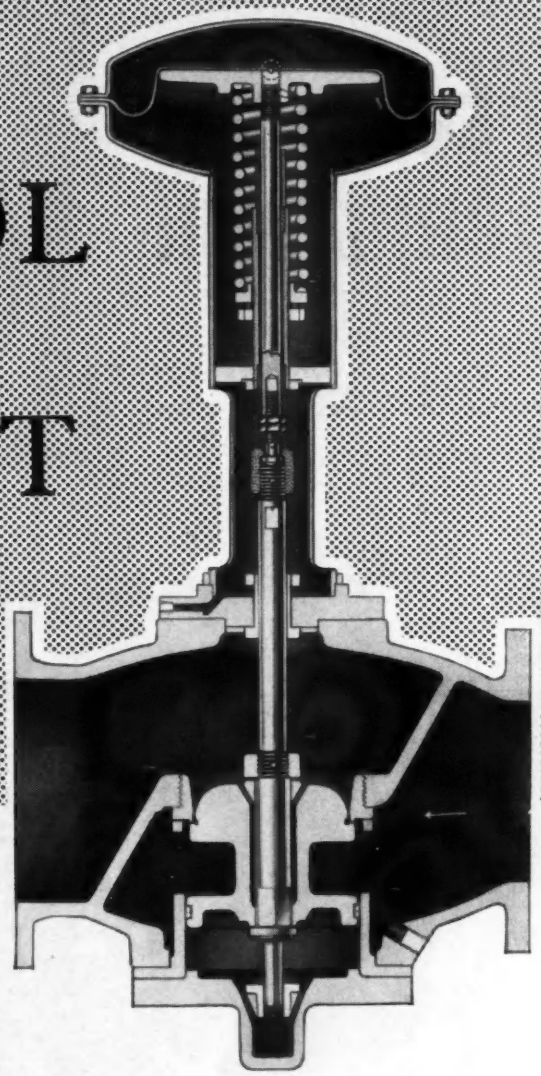

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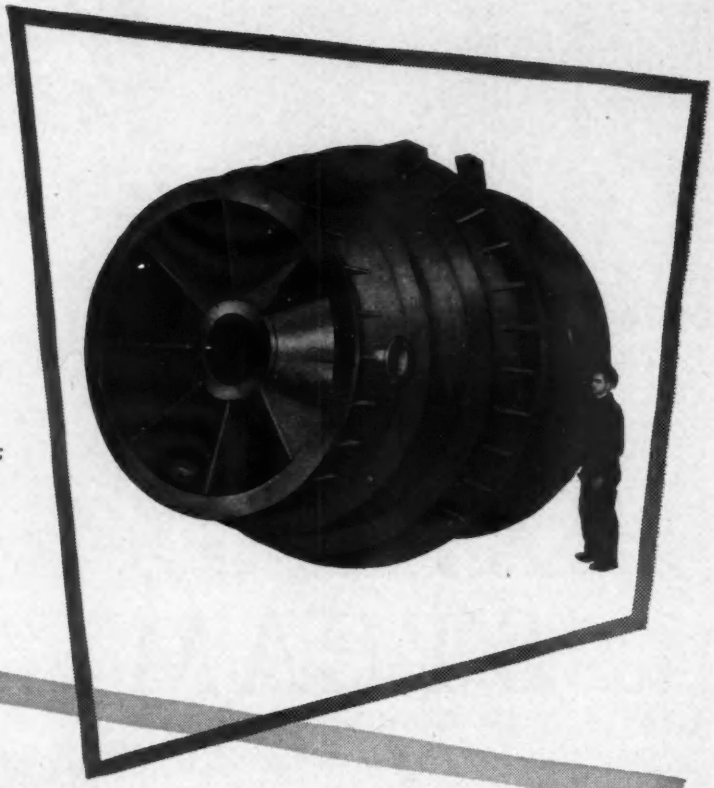
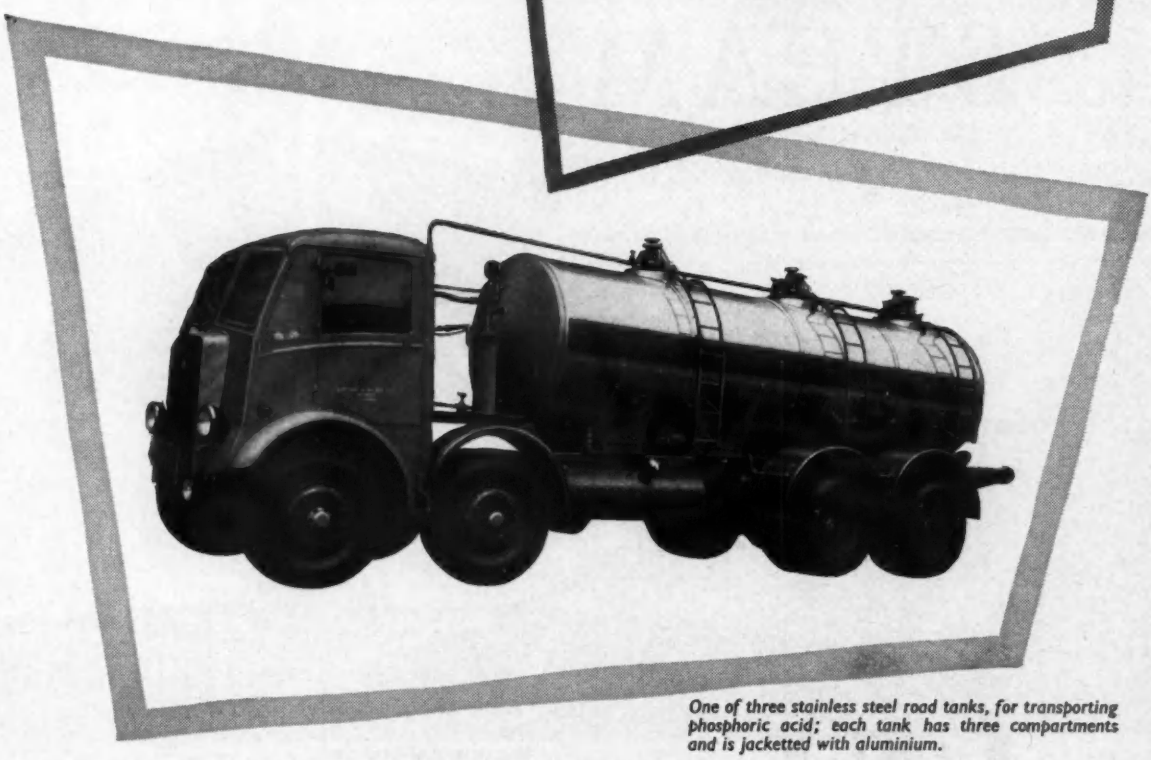


*⅞" mild steel plate valve casing, weighing 4 tons; in two pieces, a cylinder and a cone; dia. 9' 7" tapering to 6' 2" by 10' 4½" long.*



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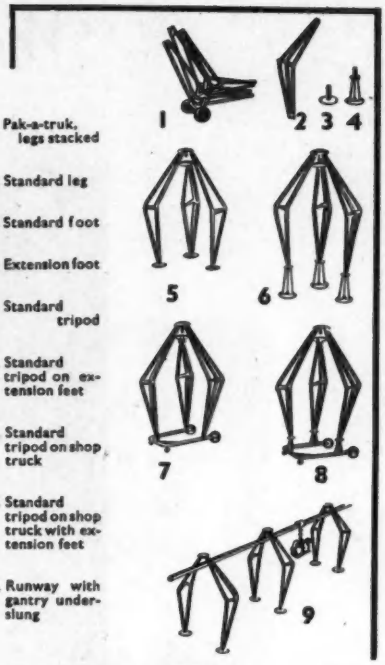


1. Pak-a-truk, legs stacked
2. Standard leg
3. Standard foot
4. Extension foot
5. Standard tripod
6. Standard tripod on extension feet
7. Standard tripod on shop truck
8. Standard tripod on shop truck with extension feet
9. Runway with gantry underslung

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Photograph by courtesy of the National Coal Board, of the west end of the Eagre £360,000 contract at Cadeby Colliery.

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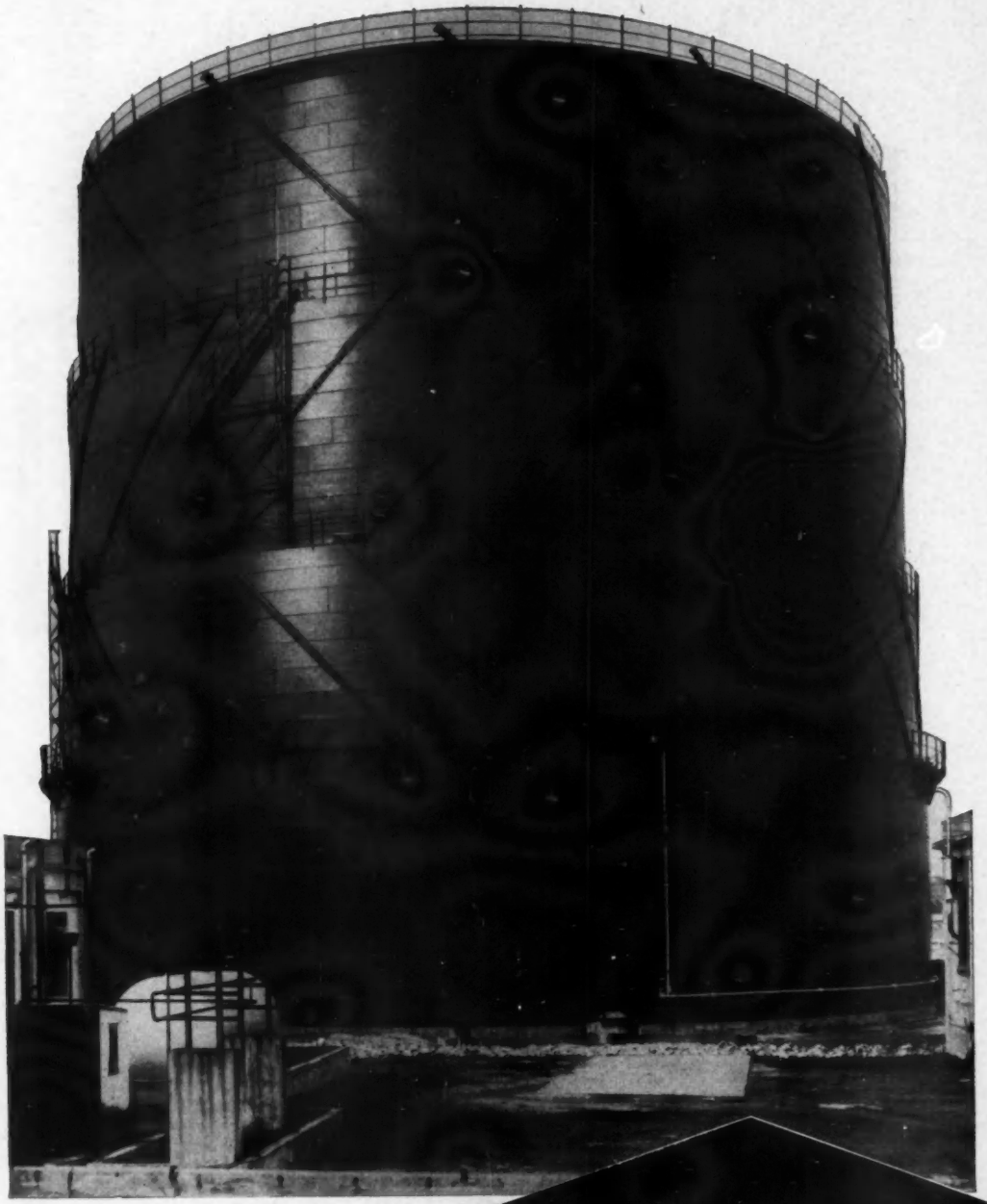

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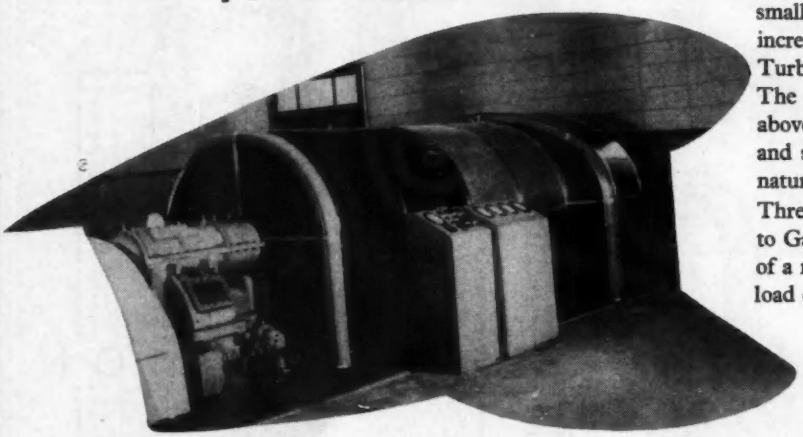

*The 2500 kW set installed at the Metropolitan Water Board's Ashford Common Pumping Station near Sunbury-on-Thames. This unit was supplied for peak load and standby operation, burning distillate oil fuel.*

Rapid starting, smoothness in running and small space requirements have led to the increasing use of A.E.I. Industrial Gas Turbines for industry and public utilities. The sets are supplied in standard ratings above 1750 kW for base load, peak load and standby duties, and for operation on natural gas or distillate oil fuels.

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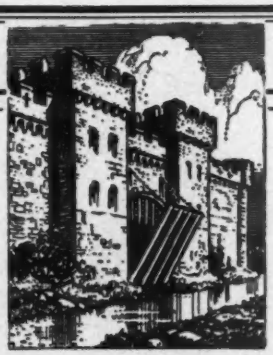

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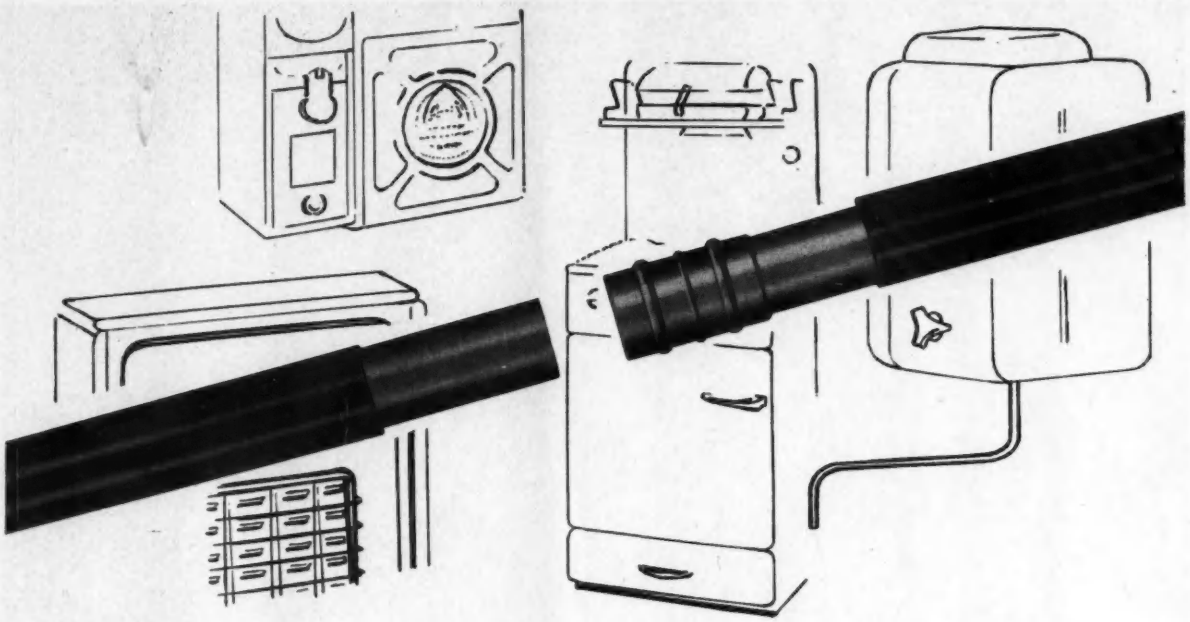

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## P.V.C. covered Copper Tubing saves time, money and labour on gas carcassing

★ **'KUTERLEX' TUBES** offer "short cuts" to gas carcassing by prefabrication of all or part of the installation when buried in floors or walls.

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★ **'KUTERLEX' TUBES** allow for expansion and contraction when buried in solid floors or behind plaster.

★ **'KUTERLEX' TUBES** reduce "carcassing" costs and future maintenance costs.

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PHOTO: HOUSTON ROGERS

Nadia Nerina, prima ballerina of the Royal Ballet, Giselle. Act 2.

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As the graceful and expressive movements of the Ballerina are the culmination of years of diligent striving for perfection, so have the faultless movements of T.G. meters been developed by constant research and painstaking insistence upon only the highest standards of manufacture and design. And now, with the wealth of accumulated experience that comes of having supplied the British Gas Industry since 1844 with meters to suit all requirements, Thomas Glover & Co. offer a service that is second to none.

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TG.47

# Gas Journal

VOLUME 298. No. 5005 JUNE 17, 1959. 111th YEAR

## *The Changed Status of Central Heating*

THE North Thames Gas Board's central heating and hot water sales campaign, beginning on June 20, is carefully timed. Simplification of methods, with the concomitants of lower costs and fewer installation problems, has altered the social position of central heating in this country during the past decade. It only remains for what one might call the 'stigma' of its association with plutocratic and expensive luxury to be broken down with evidence that an over-all heating and hot water service can be as cheap as, if not cheaper than, existing collections of separate units. New developments in gas-fired boilers virtually eliminate maintenance, and simple flues and such innovations as 'small-bore' piping systems overcome physical obstacles.

At a convention in London last week 130 representatives of contractors, soon likely to find themselves installing systems at a far greater rate than ever before, heard officers of the Board and manufacturers of appliances describe how they view the prospects. They also expressed their own ideas—and many of their doubts were purged in discussion. Since a new tariff was introduced recently, the mere announcement of it has resulted in 50 boilers being installed with a further 250 estimates under consideration. This was announced by Mr. J. A. Buckley, Sales Manager of the Board, who also said that 120 district sales representatives had received special training for the campaign.

The 'convention' of installers was an inspiration. Without a comprehensive understanding of what the Board and the manufacturers are offering, they could not be expected to reach fair conclusions. For, although the new tariff offers gas at 16d. a therm, plus standing charge, it is still not the cheapest fuel for the purpose expressed on a thermal basis. Nevertheless, with the new tariff the gas-fired central heating boiler will be wanted in small houses and flats where storage is a nuisance or impossible, and where automatic control must mean more than merely thermostatic control if household budgets are to be kept within limits.

The North Thames Board is also very wise to make its new literature on the subject strictly to the point. 'You can afford . . .' begins the title of one brochure, citing installations and using photographs to aid a potential consumer's self-identification processes. Under the tariff, one Essex suburban three-bedroomed house has hot water for the family, heat from five radiators, and the bill for 12 months was £45 12s. 4d., including gas for cooking. Maximum comfort will sell like hot radiators at that sort of price.

It is intended to give a full report of the convention in the July number of 'GAS SERVICE.'

### CONTENTS

Editorial Comment - - - - - - - - - 515
News of Current Events - - - - - - - - 516
Personal Notes - - - - - - - - - - 516
Obituary - - - - - - - - - - - 516
Diary - - - - - - - - - - - 516
96th A.G.M. of the Institution of Gas Engineers: Abstracts and Joint Discussion of two papers: Research Programme of the French Gas Industry within the Framework of the Industry's Technical Evolution, by R. Delsol and A. Renauldon; and Putting to Work the Natural Gas Deposits at Lacq, by J. Fouchier and M. Vicart - - - - - 517
Joint Discussion of two papers: Sources of Grid Gas Supply in Wales, by S. L. Wright; and The Transmission of Gas in Wales, by W. T. Hird - - 524

### Printing Dispute

**Owing to continued restrictions arising from the dispute in the printing trade, increasing difficulties have caused the size of this issue of the 'GAS JOURNAL' to be cut drastically. In addition, standards of editorial presentation may be affected.**

# Personal notes

MR. G. F. I. ROBERTS has been appointed Station Engineer, Slough Gasworks, North Thames Gas Board, owing to the retirement, due to ill-health, of MR. W. W. CHISHOLM. Mr. Roberts joined the former Gas Light & Coke Company in September, 1947, as a pupil engineer, and following spells at Brentford, Bow Common and Beckton, was appointed shift superintendent at Fulham in 1949. A year later he was appointed assistant engineer at Kensal Green and since 1956 has been at the Brentford works of the North Thames Gas Board. Thirty-three years of age, Mr. Roberts was literally born in a gasworks, for his father was an engineer at Hereford for 37 years and lived in one of the works' houses. Mr. Roberts came to the gas industry after taking his degree in gas engineering at Leeds University. A further appointment announced by the Board is that of MR. A. R. BOVINGTON to be Assistant, to the Secretary.

MR. I. H. GORDON has been appointed Assistant Sales Manager of the Cambridge Instrument Co., Ltd., at the company's head office in London. Mr. Gordon was previously Southern area manager of Land Pyrometers Ltd., and, prior to that, was with Evershed and Vignoles Ltd.

MR. R. W. HAMMOND, who has represented the Sutherland Meter Co. Ltd., for 27 years, has been appointed Area Manager of the Engineering & Appliance Division of United Gas Industries, Ltd., covering the Eastern and East Midlands Gas Boards areas.

MR. STANLEY ROBINSON has, on medical advice, relinquished the chairmanship of the Midland Tar Distillers Ltd. He will remain on the board of directors, MR. R. B. ROBINSON has been elected Chairman and MR. BRENDAN ROBINSON vice-Chairman.

MR. R. G. C. STEPHENSON, Managing Director of Indian Oxygen Ltd., has been appointed Managing Director of the Commonwealth Industrial Gases Ltd. (Australia) with effect from June 1 last.

MR. R. C. BOOTH, Finance Director and Secretary of the Commonwealth Industrial Gases Ltd. (Australia), has been appointed Assistant Managing Director.

MR. H. GIBLIN, former regional officer of the Coal Utilisation Council, North Western Region, has been appointed Manager of the Solid Smokeless Fuels Federation, with effect from June 1, 1959.

MR. C. H. GARSIDE was recently presented with savings certificates by Mr. B. C. Morton, Managing Director of Robert Dempster & Sons Ltd., of Yorkshire, on completion of 50 years' service with the company. Mr. Garside has been gasholder erection supervisor for a number of years and has followed a family tradition on the company's outside erection staff.

# Diary

**June 24.**—SOUTH WESTERN SECTION, I.G.E.: Bath. Summer Meeting and Ladies' Day.

**June 25.**—COMBUSTION ENGINEERING ASSOCIATION, SOUTHERN REGION: St. Ermins Hotel, Westminster. Brains Trust on 'The Working of the Clean Air Act'. 10.30 a.m.

**June 25.**—NORTH THAMES G.C.C.: Caxton Hall, Westminster. Council Meeting.

**June 27.**—LONDON AND SOUTHERN JUNIORS: Summer visit and Ladies' Day at Oxford.

# N.W.G.B. has £2,855,000 surplus—but expects a loss for past year

THE second largest of the 12 gas boards, the North Western, has published an account of its activities since vesting day.

In a publication called *Ten Years Stewardship* it is revealed that for the first time in seven years, the Board expects to make a loss for its tenth year, which ended in March last. The only other times when it made a loss were in the second and third years. Altough audited figures are not yet available, the Board estimate a loss of about £2.5 mill.

This, the publication says, is due to the industrial recession which hit Lancashire with special force and caused a setback of some 2% in gas sales. After allowing for this loss and providing each year for interest and depreciation of assets, the board has accumulated a net surplus of £2,855,000, representing an average annual profit of £285,000 over the ten years.

Of the 104 works taken over, including Crewe, vested in 1952, 49 are now producing gas and coke, 56 have been closed down and one, Bollington, converted into a development station.

Gas sales have increased by 12%; the yield of gas from every ton of coal processed by nearly 10%; and there is an increase of 10.4% of coke from the same source. The Board has linked up in Britain's largest gas grid system 80% of its 1,818,000 consumers. Productivity of its 16,500 employees has increased by 38%. Production plant capacity has increased by 36%.

# Obituary

MR. H. R. WILLS, of Mancetter, Warwickshire, who had spent 55 years in the gas industry at Atherstone when he retired in December, 1929, has died. he was appointed manager of the Atherstone Gas Light & Coke Co., Ltd., in 1929 and continued at Atherstone after the industry was nationalised.

MR. F. RUSCHELZKO, of Irishtown, Mountmellick, Co. Kilkenny, who has died aged 69, was manager of Mountmellick gasworks for about 30 years until it closed down.

MR. ROBERT HENRY RUTHVEN, formerly district manager of the South Eastern Gas Board at Ramsgate, has died at the age of 70. Mr. Ruthven started his long association with the gas undertaking when he joined the Ramsgate Gas and Water Department in 1910. In 1916, he moved to Morecambe to become engineer and manager of the gas department there, but returned to Ramsgate in 1922 on appointment as engineer and manager for the Corporation under taking. He retired as district manager in 1954. Awarded the M.B.E. for his services in the war years, Mr. Ruthven was in 1932 president of the Institute of Gas Engineers and Managers. He was a leading freemason. He leaves a widow and a son and daughter.

MR. H. STANLEY TAYLOR, for 25 years chairman of the old Bath Gas Company, has died aged 88. In 1935 he was appointed president of the British Commercial Gas Association. In addition to his connections with the gas industry, Mr. Taylor was well known in Bath business and civic circles.

# SCOTTISH JUNIORS ELECTION RESULTS

MR. J. T. CHRISTIE, Dundee, was appointed President of the East of Scotland Junior Gas Association when the annual general meeting was held in Edinburgh recently. Other appointments were: Vice-president, Mr. D. R. Adams, Edinburgh; Hon. Secretary, Mr. E. J. Aitken, Perth; Hon. Treasurer, Mr. I. M. Johnston, Dundee.

The short paper prize was presented to Mr. D. R. Adams, Edinburgh, for his paper entitled 'To Earlston by Moleplough.'

Presenting the Council's annual report, Mr. J. G. Rutherforth, the retiring president, said that the session had been very successful. Eight meetings had been held at which the average attendance was 32%. The total of ordinary, associate and junior members was 120.

Following the meeting and the lunch at the invitation of Mr. D. Beavis, General Manager of the Edinburgh and South-Eastern Division, the annual outing of the Association took the form of a conducted tour of Edinburgh with high tea at Turnhouse Airport.

*Abstracts and discussions of Communications Nos. 542 and 543*

# The research programme and technical evolution of the French gas industry

By R. DELSOL, *Assoc.Inst.Gas E.*, and A. RENAULDON, *Assoc.Inst.Gas E.*,

DIRECTOR AND ASSISTANT DIRECTOR OF NEW TECHNIQUES, GAZ DE FRANCE.

THE difficulty of ensuring the profitable running of numerous gas undertakings was the first factor in the development of the French gas industry, and concentration of the means of production in several large regional gasworks was the first step in improving the economy of the works.

Large volumes of gas, available in newly built coke oven plants at collieries and in iron and steelworks, have been put at the disposal of the gas industry. These large quantities of gas have had to be transported to areas of heavy consumption and one of the most important accomplishments in this field is the transport main that takes gas produced in Lorraine and Sarre coke oven plants to the Paris region.

Parallel with this attempt at concentration, the exploitation of the natural gas deposits in South West France allowed the gas production plants of a fairly large number of small- and medium-sized works to be shut down. A long-distance coke oven gas transport grid and a natural gas transport grid were thus gradually established, giving the French gas industry an entirely new look.

## Direct application

The recent and very extensive development of the petroleum industry put at the disposal of gas engineers new products of direct application—mainly residual refinery gases, liquefied petroleum gases, some low-boiling crude gasolines of no use as automobile fuel, middle oils, light fuel oils, and heavy fuel oils.

The development and adaptation to the gas industry of the Onia-Gegi catalytic cracking process is the result of close collaboration between the manufacturer and Gaz de France. The Industrial Testing Branch of the Department of Research and New Techniques collaborated also in the development of the M. S. Stein and Roubaix process, which aims at producing town gas from gaseous hydrocarbons or petrol. It collaborated also in developing the Stark process and tested the Hercules-Power process and the O.N.I.A., Société Chimique de la Grande Paroisse, and C.G.C.F. (Distrigaz) autothermal processes when they were first applied to the gas industry in France. It did research on and made a pilot plant of a simplified generator designed to ensure peak gas production from gaseous hydrocarbons, the gas produced being interchangeable with town gas.

Gaz de France created an experimental station at Sète to study certain problems, new to the gas industry, in the use of residual gases.

The problem of production of a town gas type of gas from any residual refinery gases, varying widely in composition and with time, can be considered completely solved, while the exploitation of natural gas in France has involved the problem of production of rich gases interchangeable with natural gas. Research by Gaz de France in this field has been particularly directed towards production of a propane/air mixture, or, better, propane mixed with propane reformed in accordance with a technique also developed by Gaz de France.

Among the research done by Gaz de France on gas treatment can be mentioned the work still under way on the formation of 'vapour-phase' resins and their removal by various methods, particularly by causing sudden condensation of water injected into the gas as it leaves the gasholder. Extensive studies have been made on gas conditioning for transport or injection into an underground reservoir, or also for distribution. With regard to transport, it was found that only drying by cooling or by washing with triethylene glycol are capable of being used industrially on coke oven gas. Different types of modern dedusters have been systematically tested.

As regards injection of gas into an underground reservoir, thorough treatment of coke oven gas has been carried out at Beynes, with a view, on the one hand, to removing traces of oil and gum-forming hydrocarbons, which might seal the reservoir near the shafts, and, on the other hand, the components capable of polluting the water-bearing strata.

Regarding conditioning of the gas for distribution, an extensive programme of research and industrial tests has been undertaken to determine the combined action of various hydrocarbon vapours on rubber joints.

The creation by Gaz de France, in collaboration with the Institut Français du Pétrole, of the underground reservoir at Beynes, allowed a large number of problems regarding gas storage in a water-bearing structure, especially in connection with storage of coke oven gas, to be specified. The porous medium in which the gas is stored is extremely reactive; secondary reactions take place under the effect of pressure and the enormous area of contact. Further treatment of the gas is therefore necessary after withdrawal, to remove hydrogen sulphide and metal carbonyls formed during storage.

Storage of very large volumes of liquefied petroleum gases, propane or butane, under pressure and in the liquid phase, in specially fitted underground cavities, is of great interest to Gaz de France which actually uses large quantities of these hydrocarbons for peak-load supply.

## Pilot plant

A liquid methane storage centre and a pilot plant for methane liquefaction and handling and vaporisation of the liquid methane are being built at Nantes. Gaz de France is paying great attention to this project, since transport of methane in the liquid state is one of the ways of bringing natural gas from the Sahara to metropolitan France and to other European countries.

Ten years ago there were only a small number of high-pressure gas transport pipe-lines, more or less scattered over the country, but more numerous in certain regions such as Northern and Eastern France. Gradually, these separate ele-

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ments were united to form a vast gas grid.

The gas contained in a long-distance transport pipe-line possesses inertia such that any change in flow rate at the gas-receiving or gas-supply points involves variations in flow conditions in the pipe and its subsidiaries (if any) over a variable length of time. It is useful to know these phenomena, which are complex and difficult to analyse, and to foretell them in advance in order to find the most economic operating conditions for the system under consideration. Numerous mathematical studies have been made to this end. Others were done experimentally with an original hydraulic apparatus invented by M. Renouard, a new model of which, adapted for natural gas, is being made.

Plans for electrical analogue devices have also been made in anticipation of more complex cases of branched or looped systems, which will very probably be laid in the near future.

### Intensive studies

The use, for high-pressure transport of Lacq natural gas, of pipes welded longitudinally, of large diameter (above 400 mm.) in cold expanded X52 steel, led the Gaz de France Research Department, in collaboration with eminent specialists in the iron and steel and metallurgical fields, to carry out intensive studies on steel corrosion and embrittlement, and to perfect various checks. For testing, developing and selecting equipment for equipping the high-pressure transport systems, the construction of a very large testing station was undertaken near the gasworks coking plant at Alfortville, near Paris. A first series of tests on equipment (valves, expansion valves, regulators, meters, correctors, etc.) for transport of Lacq gas is under way.

To arrive at the lowest investment and lowest operating costs, Gaz de France is at present carrying out technical-economic studies with a view to drawing up programmes of work spread over a fairly large number of years in connection with maintenance and renewal as well as the increase and extension of numerous distribution systems in its charge.

The electrical analogue computer that the Gaz de France Department of Research and New Techniques possesses for analysis of looped networks is a valuable aid for the distribution services that have to provide the necessary means for developing sales of gas. This instrument, already used for the study of the large distribution systems, enables systematic checking of the capacity of existing systems and prediction of necessary reinforcements. The Research Department is actively attempting to increase the efficiency of these methods.

Among the methods used for preservation and repair of existing installations, it is appropriate to mention the treatment already referred to, together with modern methods for repairing joints by applying special collars or by external sealing, which have recently been perfected.

In France it is not intended to increase pressure in existing systems above 500 mm. In new systems that are either extensions or renewals of former pipe-lines, the use of higher pressures allows a reduction in diameter and, hence, a very large saving in capital costs.

Taking into account the performances specified for expansion valves, which will be discussed later, two sets of pressures have been standardised: (i) Pressures of zero to 0.4 atmo or medium-pressure A, involving savings of the order of 30% in relation to low-pressure costs; (ii) pressures of 0.4 to 4 atmos, or medium-pressure B, involving savings of the order of 60% of the cost at low pressure.

It no longer seems necessary to bury pipes systematically where they are of such small diameter. Successful tests on aerial distribution have been made, as a result of which an attempt to substitute aluminium for copper has been possible. The difficulties experienced in assembling the aluminium pipes are on the point of being solved. Mention must also be made of tests on the use of plastic pipes, placed directly in the ground.

The Wobbe index is a decisive factor in burner operation and particularly controls the height of the flame. The Gennevilliers Testing and Research Station has installed and tested means for controlling Wobbe index which have given positive results in each case. It is hoped that French manufacturers will in the near future supply equipment adapted to the various problems to be solved in this field.

The Gennevilliers Testing and Research Station has also done fundamental research on pilot flames and has drawn conclusions from it on the design of natural gas burners. It has developed an industrial type of burner and has extended the improvements made in this field to domestic appliances. The need to find mixtures interchangeable with natural gas led the Gennevilliers station to make an intensive study of the interchangeability of gases of the so-called second family. Among recent work by the station, the design and development of a continuous baker's oven with radiant panels can be mentioned, which has very considerable advantages over ovens of the classical type.

Propane distribution in regions far from the natural gas transport mains constitutes for the country's economy a profitable outlet for the gases from petroleum refineries and natural gas treatment plant. It throws open gas consumption to those living in small towns whose gasworks are no longer a profitable concern in their traditional form. The predominant factor in the expansion of the gas industry in France is, however, undoubtedly natural gas. The supplies of purified gas from South West France, which were of the order of 2 mill. cu. m. per day in 1958, will be 13 mill. cu. m. per day in 1961. To these resources must be added those of the Sahara.

The French gas industry, at present affected by the arrival of Lacq natural gas, will be even more affected in years to come, first by the supply of gas from the Sahara, which involves, in particular, the problem of crossing the Mediterranean; secondly, by integration of the national gas grid into a vast European system.

# *Putting to work the natural gas deposits at Lacq*

By J. FOUCHIER, and M. VICART,

PRODUCTION AND SALES MANAGER, AND ENGINEER, COMMERCIAL DIVISION, SOCIÉTÉ NATIONALE DES PÉTROLES AQUITAINE.

THE Lacq natural gas deposits were discovered, in 1951, at a depth of 3,500 m. Since the gas is highly corrosive, due to its high hydrogen sulphide content and to its temperature, special steels had to be studied and developed for the exploratory boreholes and producing wells. Since the recoverable reserves in the deposit were at least 150,000 mill. cu. m., planned production, which will be reached in 1961, was fixed at 20 mill. cu. m. per day of gas.

Before this gas can be transported and marketed, it must undergo chemical treatment for removal of sulphur, removal of petrol, and also recovery of the sulphur. This recovery is carried out by the Claus process. In the first section of the plant, in operation since May, 1957, desulphurisation is carried out by absorption of the acid gases by diethanolamine, and petrol removal by absorption in oil at low temperature. In the section put into operation at a later date, part of the sulphur is removed by washing with water under pressure; whereas petrol is removed by several cascade cooling stages.

From 1961, treatment of the crude gas will give: 1.33 mill. metric tons of sulphur, 260,000 metric tons of petrol, 115,000 metric tons of propane and butane, and 4,500 mill. cu. m. of commercial gas.

Marketing such a considerable volume involves transport of the gas to indus-

trial areas very far from the deposits, and the construction of a high-pressure supply system about 1,800 km. in length. However, some industries that are heavy consumers are going to be set up fairly near the deposits. A large proportion of gas will be used by electric power stations, another by industries requiring a high quality fuel, and the rest by the public gas supply systems, converted to use natural gas.

The need for very regular working of the deposits, the treatment plant and the distribution system has involved, not only the adoption of appropriate commercial methods, but also a search for a geological structure suitable for storing the gas and the adaptation of this structure, at a depth of 600 m., as an underground reservoir ensuring flexible liaison between the treatment plant and the supply grid. The useful capacity of this reservoir is over 500 mill. cu. m., and the daily input and withdrawal capacity, at present 1 mill. cu. m. per day, will reach 4.5 mill. cu. m. in 1961.

The month of June, 1956, marked an important stage in the history of the Lacq deposits. Two new borings had reached the gas layer at a depth agreeing with predictions, and had almost completely traversed it, showing that the rock formation forming the reservoir was about 500 m. thick. One of these borings, equipped with tubing of A.P.S. 10M4 steel, had continuously and uneventfully discharged gas throughout the whole month of May and had proved capable of an output of 400,000 cu. m. per day of gas. In particular, the presence in the deposits of 5,000 mill. cu. m. of recoverable gas could be considered certain, which made possible the exploitation of this gas under conditions making it competitive with other forms of energy.

## Producing wells

The plans for further drilling were made with two objects in mind: To find out as quickly as possible the total geographical extent of the deposits (and then determine total recoverable reserves of gas), and to sink in the perimeter, which was already known, a number of producing wells capable of withdrawing 1 mill. cu. m. per day of gas from the first half of 1957.

The second objective was reached in May, 1957. The first has not yet been completely attained; it is now known that the recoverable reserves are at least 150,000 mill. cu. m. The programme of exploitation was consequently fixed at 20 mill. cu. m. per day of crude gas, this level to be reached in 1961. The output by March, 1959, was 5 mill. cu. m. of crude gas, and will reach 10 mill. cu. m. during the second half of the year.

Working a natural gas deposit involves not only problems of oil technology, but also chemical problems. Toxic and corrosive compounds, if any, must be removed from the gas; substances (water, petrol, butane) that would make long-distance transport of the gas difficult must be removed; products (ethane, propane) having a higher market value than the methane of which commercial natural gas consists, should, preferably, be separated.

The treatment plant must, therefore, consist of three basic parts: (i) Plant for sulphur removal, more precisely acid removal, in which hydrogen sulphide and carbon dioxide are separated from the crude gas; (ii) sulphur kilns, which recover the sulphur contained in the hydrogen sulphide; and (iii) plant for removal of petrol which separates the higher hydro-carbons (from ethane to petrol) from the methane.

From 1961, the works will produce per annum 4,500 mill. cu. m. of commercial gas (almost pure methane), 1.33 mill. tons of sulphur, 260,000 tons of petrol, and 115,000 tons of liquefiable petroleum gases (butane and propane).

## Better understanding

A summary of the legal position of the French gas industry will give a better understanding of the marketing position. The nationalisation law of 1946 made a national undertaking (Gaz de France) responsible for almost the entire gas supply in France. In 1957, this public service sold a volume of gas equivalent to 14,300 mill. thermies. The purified gas produced by the Lacq plant —almost pure methane—has a calorific value of about 9 thermies per cu. m. The annual production in the years 1961 onwards will thus correspond to about 40,000 mill. thermies.

In investigating the disposal of such a quantity of gas, a distinction had to be made between two regions of France —indeed, in the south west region (approximately bounded by the line Libourne—Béziers), natural gas is no novelty, since methane from the Saint Marcet reserves has been distributed there for more than ten years by a piped supply system several hundred kilometres long. But the development of this supply system and extension of consumption in the south west would not have been sufficient to guarantee the sale of Lacq gas. This region is, in fact, one of the least industrialised in France, and, although the appearance of a new and abundant source of energy must encourage its further industrialisation, it was absolutely essential to divert part of the gas to other consumer regions. In fact, from 1961 it is hoped to supply 5 mill. cu. m. to the south west and 8 mill. cu. m. to other districts of France out of a daily production of 13 mill. cu. m. of commercial gas (corresponding to 20 mill. cu. m. of crude gas).

## The advance

A few dates illustrate the advance of the distribution system: Nantes has been supplied with Lacq gas since November, 1958; Lyons will be reached in May, 1959, Dôle the following month. The main supplying the Paris region will, in November, 1959, reach the town of Montereau, which is at the boundary of this region. The gas will reach Paris a few months later.

It is interesting to compare distribution of consumption among the various users in 1956 with that forecast for 1961. The following table shows the two distributions (in percentages of total consumption in the year under consideration):—

| | 1956 (Total consumption: 306 mill. cu. m.) Per cent. | 1961 (Total consumption: about 4,500 mill. cu. m.) Per cent. |
|---|---|---|
| Domestic consumption | 31.1 | 11 |
| Motor fuel ... ... | 14.8 | 2 |
| Industrial fuel ... | 13.7 | 44 |
| Electricity (generation in power stations) | None | 33 |
| Chemical synthesis ... | 40.4 | 10 |

This table shows the considerable part that natural gas will play as industrial fuel, even ignoring the electric power stations. It can be deduced that there will be lively competition between gas on the one hand, and coal and fuel oil on the other.

The irregular nature of the demand for gas is one of the fundamental problems of the gas industry, which has to face daily, weekly (since consumption by industrial consumers falls off considerably at week-ends) and seasonal (increased by the development of gas-fired heating) variations in consumption.

There is, therefore, a need for storage of purified gas between the preparation plant and the supply grid. The size of the volumes to be stored being too high for gasholders, underground storage must be resorted to. Underground storage did not exist in France till now, and the creation of reservoirs was complicated by the fact that the search for hydrocarbons is fairly recent in France, so that the country cannot use spent wells for gas storage. A geological structure suitable for storage and recovery of very large volumes of gas had to be found, studied and adapted.

On examining the results of prospecting carried out previously by the S.N.P.A. in the search for hydrocarbons, five structures were found with encouraging characteristics. The most promising was that at Lussagnet, a village situated 60 km. to the north east of the deposits, i.e., in the direction in which the major part of the commercial gas must be transported. The detailed study of this structure, which lies at an average depth of 600 m. below ground, began in the spring of 1957 by the drilling of five shafts surrounding its highest point. The object of these borings was to check the characteristics of the geological formation suitable for receiving the gas (a layer of sand 45 m. thick) and of the impervious layer—called the 'roof'—above this sand.

Completion of these borings marked the transition from the period of study to the period of exploitation and development. This second period has continued uneventfully up till now and will go on till the end of 1960. At the beginning of 1959, the input capacity into the reservoir was 1.5 mill. cu. m. per day and withdrawal capacity 1 mill.. cu. m. per day. The equipment programme anticipates a withdrawal capacity of 4.5 mill. cu. m. per day from 1961.

The following figures illustrate the

| | |
|---|---|
| operating conditions of storage at Lussagnet:— | |
| Gas pressure in the reservoir ... ... | 56 to 61 kg. per sq. m. |
| Mean flow from each shaft ... ... | 250,000 cu. m. per day. |
| Distance between shafts ... ... | 150 m. |
| Area of the 'collecting zone' (perimeter including all the shafts) ... ... | over 1 sq. km. |
| Useful storage capacity ... ... | At least 500 mill. cu. m. |

The Lussagnet reservoir is connected to the Lacq works by a 600 mm. diameter pipe, which constitutes the first part of the Lacq—Angoulême main described previously. Besides this, Lussagnet is connected to the south-west regional grid, which in this way also benefits by the control capacity of the underground reservoir.

# DISCUSSION

**Sir Henry Jones,** Deputy Chairman of the Gas Council: 'We are grateful to the authors of the two papers presented to us for enabling us to understand the research programme of the French gas industry, and the remarkable technical feat of putting to work the natural gas deposits at Lacq which has been performed by the Société Nationale des Pétroles d'Aquitaine.

'In receiving these papers today we can see many problems in common, but we can see also ways in which the industry in France is developing along lines different from those adopted by the gas industry in the United Kingdom. The principal reason for this is clear from the paper by MM. Fouchier and Vicart, and from the film which we have seen. If there were a source of gas in Great Britain such as that at Lacq which would produce in 1961 among other products, 4,500 mill. cu. m. of gas, almost pure methane, the trend of development of the gas industry in this country would be somewhat different. This source is equivalent in round figures to the gas made by the carbonisation of 20 mill. tons of coal a year, or the gasification of, say, half that quantity; and from the figures quoted in the paper there seems no reason to suppose that this figure is the limit to the amount of gas which could be produced in a year if so desired.

'As in France, supplies of gas have become available in the United Kingdom from oil refineries, and part of the research of the Gas Council has been directed towards the efficient utilisation of the various products of oil refineries as raw materials for gas making. On the other hand, the Gas Council has been and is actively engaged in developing processes for the gasification of coal, and some of the problems met in gasifying coal may be more readily solved after experiments in the gasification of oil.

'Further points in common between the industries in the two countries are found in the utilisation of gas; for example, the necessity for interchangeability of gases made from different materials by different methods, and the use of common flues, one design of which is the Seduct developed by the South Eastern Gas Board for use in tall buildings.

'Some questions occurred to me on reading the paper by MM. Delsol and Renauldon.

'First, reference is made to the necessity for establishing new formulæ for the transmission of gas by pipe-line. Could the authors tell us in what way the existing formulæ have been found to be inaccurate or unsuitable?

'Secondly, on [p. 11] of the same paper reference is made to pipes welded longitudinally in cold expanded X52 steel. Could the authors give the composition of this steel and tell us whether the pipes have been entirely satisfactory?

'In the paper by Fouchier and Vicart, one may read a record of a tremendous task of engineering—civil, chemical and mechanical. A particularly impressive section tells us that after finding problems never before met in handling very corrosive gas at high temperature, two years of research led to a precise knowledge of the mechanics of corrosion and enabled a special steel to be developed.

'Answers to the following questions would be interesting:

'(1) The starting pressure in the high pressure pipes is given as 65 kg. per sq. cm. It is stated that this pressure was chosen for "technical-economic" reasons. Does this mean that the theoretical economic pressure would be even higher and that this pressure is the highest regarded as technically practicable, or do other considerations arise?

'(2) On [p. 13] it is stated that apart from power stations at Nantes and Lacq, Electricité de France will use the gas in four power stations, one at Bordeaux and the other three in the Paris region. Can the authors give any indication of the price at which this gas is sold for power generation?

'(3) On [p. 14] reference is made to aluminium cylinders containing gas at 200 kg. per sq. cm. for use on vehicles. Can we know which alloy of aluminium is used?'

**Mr. L. W. Andrew,** Manager, Watson House: 'I would like to tell the authors how very much in Great Britain we appreciate the research work done by M. Delsol and his colleagues in Paris. They have tackled so fundamentally these questions of interchangeability, of combustion characteristics, of appliances with the natural gas and various types of gas of family one as they call them in France, and their research has been so thorough that it has been of the greatest help to us in Great Britain in our own research work on interchangeability of family one gases. We appreciate it so much that I am very happy to say that we have had an interchange of staff with the Gaz de France laboratories; so far the interchange has been one way, but we are looking forward to extending it, because I am certain that we have a great deal to learn from each other.

'I should like, if I may, to put four simple questions on which I would like to have some more information.

'First, could we have the latest information on the pattern adopted in changing over a district from gas of family one to the natural gas? I think that the whole pattern of moving over on such a fundamental change, and what it costs, would be of very great interest to us.

'Secondly, the change-over to natural gas on newer plant is, I believe, well understood. It was done in America, and the factors are known. What I am not clear about from the paper is, having developed some very flexible burners, what is happening in practice? Is Gaz de France thinking of newer plant which has burners so flexible that they can almost immediately operate either on gases of family one or of family two? If that is so, then are there any technical disadvantages in the more flexible burners?

'Thirdly, there is some mention of pilots and sooting from pilots, and it may be that the whole question of pilot performance is of great importance with all the various types of gases. In Great Britain we have paid very great attention to the effects of gas composition on the operation of pilots associated with flash tubes, and we would be interested to know, in their experimental work and in the field, how they are getting on with the performance of pilots on a plant and the whole question of automatic ignition. We are having to use 30 test gases; I think they will probably have to use about a hundred, but the results will be exceedingly interesting.

## Meters

'Fourthly, reference is made to meters. I should like to know whether or not with the natural gas, some of the experiences in America and, I believe, in Italy, have been repeated in France. Has it been possible to use the same type of diaphragm treated in the same way? Is there any difficulty experienced with new meters on natural gas, and if not, have any difficulties been experienced on meters which have used family one gases and then have changed over to family two?'

**Dr. A. E. Haffner,** Chief Engineer, the Southern Gas Board: 'Earlier than the British, the French, less favoured by coal, became increasingly aware of the possibilities of utilising petroleum products, including refinery gas. From afar their endeavours have earned our praise, but when one visits them, as I have been gratefully privileged to do so, at Sète, Cahors, Paris and Beynes underground storage, one becomes even more impressed by the competence of the engineers engaged on these projects. Still more impressive is to see the effect of the arrival of M. Delsol on such a group.

'I should like to ask two specific questions on the investigations on the nickel catalyst of the Onia-Gegi process. It is known to be a robust catalyst tolerant of high sulphur contents in liquid feed-

stocks. It is disappointing to find its unexpectedly high sensitivity to small proportions of sulphur in gaseous feedstocks. Have the authors any experience of this, and have they found any catalytic modification which has been helpful?

'With regard to feedstocks, the sulphur distributes itself during the make as (a) hydrogen sulphide in the gas, (b) organic sulphur in the gas, and (c) sulphur absorbed on catalyst and released during the blow. Have the authors made a study of the optimum operative conditions or catalyst constitution to produce minimum organic sulphur in the final gas?

'The research and development programme of Gaz de France is all embracing and in all directions they have been brilliantly and uniformly successful. They have achieved success in (1) development of new processes and adaptation of existing ones; (2) logically assessing combustion characteristics; (3) developing new techniques in both transmission and distribution; (4) establishing successful underground storage and dealing with the problems of storing manmade gas as distinct from the simpler natural gas, and (5) improvements in gas utilisation.

'The French gas industry, partly through the discovery of natural gas, has had a renaissance. The quantities of gas are so vast that the recoverable reserves of 150,000 mill. cu. m. needs to be translated into the more familiar term of a 14 years' supply of the entire British gas industry. The planned usage by 1961 represents about two-thirds of the British gas industry and the French reserves will last for 25 years.

## Problems remained

'The gas well began sensationally by uncontrolled eruption and although this was gloriously tamed, the immense problems remained of dealing with hot and corrosive gases at high pressures. Some of these problems had no world experience to help them, and it was vital to exploit this newly found raw material as rapidly as possible. The brilliant solution of the metallurgical problem and the rapid commissioning of chemical treatment plant first by established methods and in later phases by newly developed techniques and the rapid spread of the distribution system across France have excited our admiration. The natural gas may be there for the cost of the getting but the heavy capital expenditure stresses the importance of uniform usage and elimination of seasonal variations. Of all the devices proposed to eliminate this variation, the most attractive is underground storage, a development which is being followed with increasing interest by the British gas industry.'

**Mr. T. S. Ricketts,** Chief Engineer, the Scottish Gas Board: 'In both of the papers which have been discussed this morning, definite mention has been made of the future probability of piping the gas deposits from the Sahara across the Mediterranean and of the creation of a vast European gas grid.

'The laying of a pipe-line across the English Channel will have to come under investigation in any scheme of this nature. The political implications of such a step are obvious.

'I should like to say a word about domestic coke production. There appears to be no place in the scheme of things for domestic coke production in France, and therefore there appears to be no demand for coke. Is this so? Will the Englishman's preference for an open fire disappear in the light of natural gas reserves in England if they should be discovered?

## Underground storage

'Complementary to the discovery of the natural gas reserves was the need for purified underground gas storage between the preparation plant and the supply grid. This is understandable, since continuity of gas flow into the grid must be maintained. What is amazing, however, is the speed at which the development was carried out. It is stated that detailed study commenced in the spring of 1957 by the drilling of five proving shafts; by the beginning of 1959 nearly 50 mill. cu.ft. of gas per day was being put into storage and could be withdrawn from storage at the rate of 35 mill. cu.ft. per day if required. That is truly a lesson in speed to all concerned with such operations. The time has undoubtedly come when we in this country must obtain provision of similar underground storage facilities, for the poor load factor imposed upon gas production units which are called upon to meet the varying seasonal gas demand makes it impossible to produce gas at an economic cost.

'Finally, the reserves of natural gas, containing as they do more than 15% of $H_2S$ were not by any means easy to handle, and the ultimate and successful treatment decided upon reflects great credit on all concerned. The removal of $H_2S$ by amine is fairly usual, but the removal of $H_2S$ traces by washing with caustic soda is not, as far as I know, quite so usual. I think that we may be able to learn lessons from that in this country.

'The sulphur recovery plant involving the use of the modified Claus kiln process is of especial interest to those of us who have much the same problem when removing $H_2S$ and $CO_2$ from high pressure gases; in this case, however, the high ratio of $H_2S$ to $CO_2$ apparently enabled sulphur recovery to be carried out with little difficulty.

'I should like to ask a question regarding the formation of methane hydrates. Is any trouble experienced in the formation of methane hydrates at any stage in the plant? In Scotland from time to time we find deposits in the pipes of methane hydrates with consequent blockages which in turn cause depression of temperature owing to a violent reduction of pressure. We have not quite overcome that yet.'

**Mr. R. J. S. Thomoson,** Chemical Engineer's Department, W. C. Holmes & Co. Ltd.: 'I had the good fortune of living in France and working in close contact with the French gas industry when many of these developments were just beginning; at the time when the Lacq gas deposits were found, when the Onia-Gegi process was being developed, and when the first propane-air plant had been put into operation. In all these matters I had some interest, as the firm I was associated with in France received inquiries for plant and equipment in connection with all these enterprises, which have now been brought to fruition, and it is most interesting to read the authors' account of their development.

'These papers show throughout the French zest for investigation and development, whether they are accounts of official work or of work done more individually outside the actual research organisation. This is the work and spirit which have led to developments which have taken the French gas industry so far.

'The French gas industry now has considerable experience of the long-distance transport of gas and its compression and recompression. I should like to know what types of compressors are most favoured, and whether difficulties have been experienced by pressure fluctuations and vibrations in the pipelines following the compressors? If so, what steps have been taken to eliminate or reduce such difficulties, and what pressure loss is occasioned or considered reasonable for any apparatus which has been installed for this purpose?'

**Dr. A. Parker:** 'About 12 months ago I had the task of advising on the treatment of gas from petroleum wells in the Middle East. The main difference was that the gas in the Middle East was obtained at ordinary pressure, not high pressure, but that gas contained 30% of hydrogen sulphide. The quantity involved would require the recovery of about 300 tons of sulphur per day, and the gas had to be treated to make it satisfactory for distribution under pressure over a distance of about 200 miles for use by the consumers.

'Various schemes were submitted and, as happens in new schemes of this kind, the prices asked ranged over an enormous amount from, say—putting them on an equivalent basis—about £7 mill. capital to £11½ mill. I could not always see why there were those big differences.

## Better solvent

'Of the various proposals put forward, some suggested diethanolamine for recovering the gas and some monoethanolamine. In this case I recommended monoethanolamine because it is a much better solvent. It requires a very much smaller scrubber because the size of the scrubber is not limited by the gas flow, but by the rate of distribution of the solvent. I should like to ask the authors whether they can tell us exactly why they have, after experience with diethanolamine, changed to monoethanolamine.

'I also notice that they started by removing the E.P.B.—the ethane, propane and butane—gases by oil washing. I gather that they are now going to

change over to propane refrigeration and fractionation. Both these methods were submitted in the various schemes that I considered, and I chose refrigeration. Of course, we had to compress the gas in the first place to bring it up to this high pressure before we started treatment. The reason we chose refrigeration is that there was a better chance of getting rid of undesirable hydrocarbons which were likely to condense with change of temperature in the long distribution main.

'There is one other point, that of drying. With oil washing to remove E.P.B., were they able in France to remove the whole of the water, or had they a dehydrating system using, say, glycol—otherwise, they would run the risk of having hydrates deposited in the mains—a point which was referred to by a previous speaker.

'I am interested particularly in the new scheme where the acid gases or part of them are first removed by washing with water under pressure. I just wonder whether, if the costs were got out, it would not still be found cheaper to remove the whole of the acid gases with monoethanolamine and not have the two-stage process. How is the sulphurated hydrogen removed from the water when it is washed out by the water, how frequently have they to rinse the water, and if it has to be renewed, what do they do about the effluent problem?'

**M. M. Vicart** replying to the discussion said: 'A question was asked about the price at which our methane is sold to Electricité de France. In this matter we have no secret to hide from our British friends. When we realised the huge amount of gas that there was at Lacq, we wondered to what customers we would be able to sell it. Naturally, we were looking for big customers. To Electricité de France, which was obliged to make a considerable expansion in its capacity, the gas was very interesting, and we managed to sit down round a table and some months later there was drawn up a rather important protocol in which the price of the gas was not determined. The price was to depend on the production cost of the methane. Every improvement in our technical methods to a certain extent benefits Electricité de France. Perhaps you may wonder why we accorded such an advantage to them, but the reason is very simple. We needed, above all else, to start the exploitation of the field, we needed a big customer, and we could not find any other big customer than the Electricité de France. Of course, our firm is a Société Nationale, and it must take account of the national interests.

'Reference was made to our underground storage and to the speed at which it was developed. In our industry, and especially in the Société Nationale des Pétroles d'Aquitaine we are accustomed to going very fast—sometimes too fast. I would add that, being a petroleum firm, we have had great experience in underground problems. Of course, that is what we are paid for.

'I said in presenting the paper that the doors at Lacq are wide open to you. The doors of the underground storage equally are wide open to you—and I would add that, ten miles from the storage, there is an excellent restaurant!

'Dr. Parker spoke about monoethanolamine and wondered why we first used diethanolamine and then monoethanolamine. In that we have no secret. When we started developing the Lacq field, we did not have very much knowledge about natural gas and especially about sulphuretic natural gas, and in those conditions we naturally made mistakes. Dr. Parker also asked why we sometimes use oil washing and sometimes refrigeration. Although I am not a clever technician, I think I can answer that question. When we started building the plant, we did not intend to extract ethane. After a time we saw that it was interesting to extract ethane, and I believe that that is the reason why, in the second section of the plant, we use refrigeration.

**M. A. Renauldon:** I should like to express my thanks to all those engineers who have taken an interest in the paper by M. Delsol and myself. I am not so courageous as my colleague—perhaps because I am older than he is—so I shall not attempt to say very much, but will answer the questions in writing.

'A question was asked about the composition of the X52 cold expansion steel. I should say now that it is taken from the A.B.I. standard. With regard to the economic pressure, we kept the pressure at 70 atmos. because that is the pressure which is used as a maximum in America, and the economic considerations are calculated on this maximum pressure. For the main to the east of Paris it was not the same—40 atmos. was really the economic pressure. We intend to have a higher pressure for the main between Africa and Europe. We think it would be up to a high pressure of perhaps 400 atmos.'

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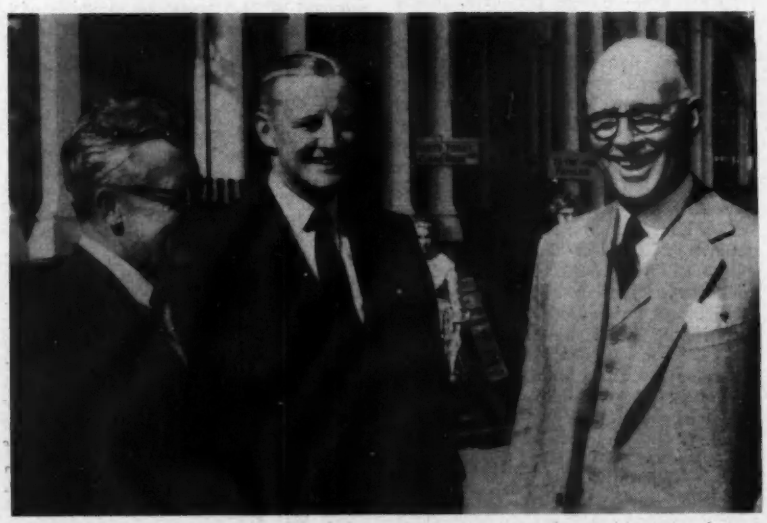

*J. E. Cooper (East Midlands), Jack Smith (Meters Ltd.) and Sam Hall (Thomas Glover & Co., Ltd.).*

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*Joint discussion of Communications No. 547 and 548**

# SOURCES OF GRID GAS SUPPLY IN WALES

*By S. L. WRIGHT, B.Sc., M.Inst.Gas E., Gas Engineer and Planning Officer (Production)*

# TRANSMISSION OF GAS IN WALES

*By W. T. HIRD, M.B.E., M.Inst.Gas E., Distribution Engineer and Planning Engineer (Distribution), Wales Gas Board.*

**Mr. G. E. Currier**, O.B.E., Deputy Chairman, North Eastern Gas Board: 'I see from [Table 1] that, even at 250 p.s.i., the wall thicknesses of pipe specified by Mr. Hird give factors of safety which are somewhat higher than those suggested in the report (of the Institution Panel for the installation of high pressure gas pipe-lines) for pipes laid in open country. Mr. Hird states the practical reasons for this in that there is a certain minimum thickness of pipe which is suitable for handling and welding. I should be interested to learn whether any of the pipe-lines pass through built-up areas and, if so, what is the minimum distance of the pipe-line from the nearest building.

'Mr. Hird does not deal with the method of control of the grid—possibly each holder station has a shift attendant—and it would be of interest to know how control is exercised, particularly in respect of the full use of holder storage. Has Mr. Hird considered the need for automatic isolating valves to close in the event of a sudden fall in pressure and to act as a safeguard? While speaking of valves, these are mentioned as being fitted at intervals not exceeding five miles. What is the distance between valves in built-up or developing areas? What maintenance is needed for the valves which have been used? A further question I would ask here is whether in any of the more remote parts the main has been laid above ground?

The year 1953 is important in the history of the Wales Gas Board. Mr. Hird went to the U.S.A. as a member of the O.E.E.C. Mission; long-term agreements were determined for the supplies of methane and coke oven gas and, later in the year, decisions were reached on the design, specification and construction of the interconnecting mains which were required.

'Mr. Hird was faced with the problem of conveying relatively small quantities of gas over comparatively long distances—and he had only some two and a half years in which to design and construct, at a time when steel pipes were not abundantly available.

'The Wales Gas Board inherited a grid in the South constructed in spun iron and operated at 33 p.s.i. The North Eastern Gas Board similarly inherited a grid in West Yorkshire constructed in spun iron and operated at 30 p.s.i. We have added to the grid very considerably since vesting day and are continuing to do so, although the bulk of the work has now been completed. We have continued to use spun iron at 30 p.s.i. because of the long trouble-free life of this material and because the pressure is, in our case, suitable for the distances and quantities of gas involved.

'Different circumstances in Wales caused Mr. Hird to choose higher pressures and steel pipe. One main reason for this was the speed with which it was possible, with steel, to complete the many miles of main which were required—time was important to him. We have become perhaps too used to long deliveries—and to accepting them. Once a project has been shown to be justified financially then clearly it is required to be completed as soon as possible.

'Mr. Hird says that the pipe-lines will not operate at maximum pressure for many years. Here he appears to disagree with the American practice, which he quotes, of constructing pipe-lines for the highest possible load factor in use.

'The special problems of gas supply in Wales are, I think, reflected in [Table 10 on p. 32], which shows that the capital and compressing costs for the pipe-lines are 3.14d. per therm for North Wales and 4.94d. per therm for South Wales, west of Llanelly. In some circumstances these costs might appear to be high, but the criterion is, of course, that the pipe-line gas, including capital and compressing costs, is cheaper than the gas it replaces. I should be interested to know what depreciation period has been taken for the mains.

'The elimination of buildings, wherever possible, is to be commended. Where buildings are essential the design has been of open construction, of which the Ammanford compressing station is a pleasing example. I should be interested to learn whether these have proved entirely satisfactory in practice. What precautions are taken against frost?

'I am interested to note the policy of the Wales Gas Board to accept requests for gas and to supply from the pipeline.'

**Mr. W. S. McGowan**, Australian Gas Light & Coke Co., Ltd.: 'My function is that of Operations Manager, and I am particularly concerned with the use of the plant which has already been provided; I am not so much concerned with the ultimate or the future design, but with what is already there, looking from a production, a maintenance and a distribution point of view. Therefore, I should like to ask the authors of the papers to what extent is there some effort at optimising the day to day, week to week, operation so that you do supply to the consumers gas at the lowest possible cost, taking into account the cost of production, the cost of maintenance work and the actual cost of distribution?

'Next, I should like to ask if there are any problems of interchangeability. There seems to be no reference in the papers to that particular matter. Is there any problem in distributing to your consumers gases of slightly different compositions and combustion characteristics?'

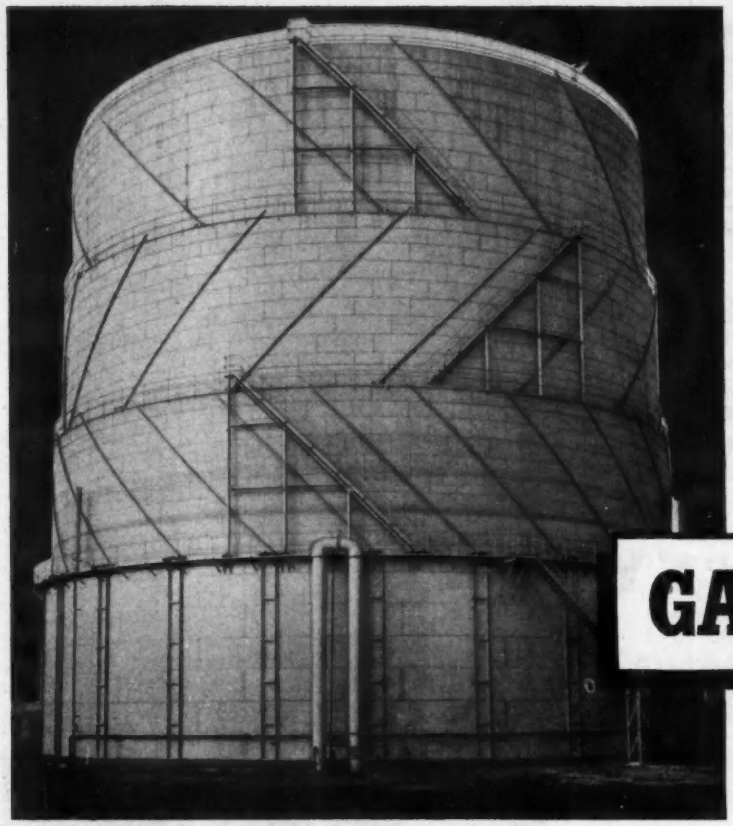
**Mr. W. R. Branson**, Deputy Chairman, West Midlands Gas Board: 'Having been associated in the early post-vesting period with the planning of a small part of the work described, I naturally read the paper with great interest. In particular, I looked to see how far the estimates of gas requirements set out in the paper presented to this Institution in 1952 by Mr. Hird and myself had been realised to date, and what changes were now felt to be necessary in forecasts of later requirements.

'It would seem that in South Wales, while the earlier estimates of average summer load were not far out, maximum daily demand is now expected to be much greater than was at first thought [Tables 3 and 5 on pp. 8 and 13]. In fact, the ratio of maximum day to average summer load of 1.5 in the 1952 paper has grown to 1.87.

'This worsening of the load factor in an area so largely dependent upon purchased supplies of gas calls, in the

* Abstracts of these two papers were published on June 3.

96th A.G.M.



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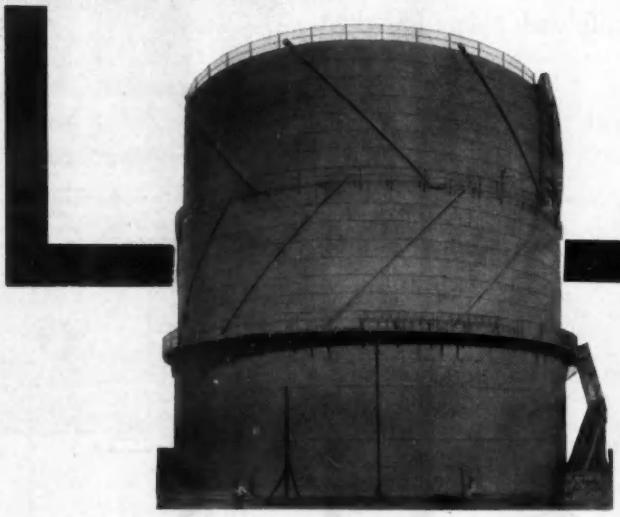

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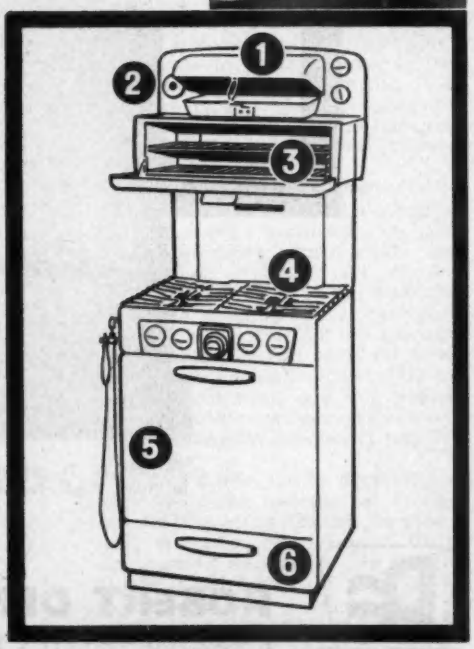


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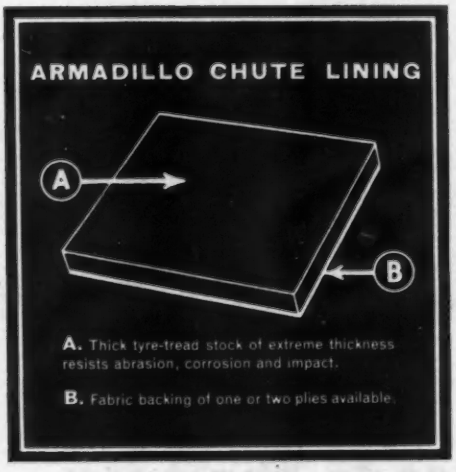
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design of plant and in the selection of raw materials for gas manufacture, for the closest attention to flexibility. Throughout the paper, Mr. Wright shows very clearly how this need for flexibility has been met.

'In North Wales, too, it is apparently also expected that the load factor will worsen in spite of the inclusion in this grid area of a number of coastal resorts which must help to balance the seasonal load.

'There are one or two questions I should like to ask the author arising particularly from earlier knowledge of the area. In the original planning in South Wales, we did adopt a gasholder capacity figure of 12 hours storage based on maximum daily output. It would be interesting to know whether this figure has been found to be adequate.

'The use at the Aberavon works of blast furnace gas as a diluent for public supply is, I believe, unique in the United Kingdom. Has its use led to any difficulties, particularly any arising from gum formation?

'No reference is made in the paper to the odorisation of methane or of gases derived from methane. Perhaps the author would tell us whether it is practised and, if so, the material used, the dosage found necessary, and whether the odorant is added at the colliery or at the receiving works.

'On [p. 14] the author refers to the possible provision of additional coke oven gas supplies through the use of slagging-type gas producers for underfiring coke ovens. This was also referred to by the President in his address yesterday. The high cost of producer gas made from coke has retarded development of producer gas firing of coke ovens and the realisation of the undoubted resulting advantage in constancy of composition, under varying load conditions, of the gas supplied to the grid. Further research into, and development of, the coal-fired slagging producer might be well repaid and would help the National Coal Board to find an outlet for non-coking fines.'

## Modified spread

**Mr. Hector Walker,** Constructors John Brown Ltd.: 'A great deal has been said on the American pipe-laying spread, but I shall confine myself to the equipment. The equipment makes the American spread a very expensive thing, even in the modified form which we have arrived at today compared with the early days. One often hears it said that a man is being sent on a boy's errand, but in this case we have a man doing a boy's errand frequently in this country. It cannot be avoided; it was what originally led to the fact that we could not put an American spread in this country; we have not the wide open spaces and our population density is too high. We have reached the modified form. Nevertheless, it has an insatiable appetite. To make the most use of it and get on with the job, it wants considerable pipe-lining, because once you start the spread you want to keep it going. The main thing to do is to get the right-of-way cleared and to get everything laid on for the road and rail crossings, and let the main spread get on the job.

'It is in welding that we get our great advance. The introduction of downhand welding changed our attitude of mind completely; instead of feet per hour it became feet per minute. All sorts of incentives were given to the men. Then we brought in two American welders and put them on the job. The British saw the Americans doing it, and they said, "So can we, and we can get bigger speeds than that." The speed of welding in this country must be controlled by the machines to a certain extent.

'A lot has been said on coating and wrapping over the line. It can be done. What we find with modern stationary coating and wrapping machines is that we can do a good job. I mentioned the modified form of spreading. I think it is this modified form which is giving such good results, and it has changed the picture of Mr.Hird's figure of 7,000 yards per month to 7,000 yards per week.

'The biggest contribution to design has been the high tensile steel, or rather the high yield point steel.'

**Mr. T. S. Ricketts,** Chief Engineer, Scottish Gas Board: 'The early programme of grid construction was based until 1954 almost entirely upon the use of pressures of 30 p.s.i. maximum and it was not until 1954/5 that Mr. Hird really began to go in for the use of steel pipes and higher pressures. There can be no doubt that he has been justified in his decision; I would not say that this would apply in every case elsewhere, however, for there is no doubt that the extra cost of steel pipes can be heavy if no increased demand is obtained in the future.

'Mr Wright in his paper deals with the sources of gas supply which have become available to the Wales Gas Board in recent years. Truly a surfeit of riches! In my capacity as Manager of the South Wales Gas Grid from 1951 to 1955 one of my chief recollections is that of the worry and constant efforts we made to absorb into the grid the very high percentage of base load coke oven gas which was available both summer and winter. At that time the largest coke oven plant at Nantgarw had no gasholder at all, and Mr. R. J. Barritt and Mr. West will remember the friendly arguments which developed from time to time in respect of gas flaming away during periods of low demand. The trouble of summer time surplus gas appears to have been overcome; perhaps Mr. Wright could say a word in respect of any special measures which have been taken.

'The Aberavon gasification and compression station employed many novel features, and there are a number of questions I would like to ask.

'Have the diesel-driven gas compressors proved to be more reliable in operation than the electrically driven compressors? Have the reinforced concrete purifiers proved satisfactory in operation? I notice that they appear to have been upgraded in capacity; they started off as 20 million cu.ft. per day capacity, now they are 24 million cu.ft. per day. Why is this? Have any serious interruptions in supplies of crude gas from the coke ovens been experienced?

'I am rather disappointed that so little is said about grid control; the secret of the successful operation of the Wales grids lie in efficient grid control, but perhaps the authors consider that sufficient has been said elsewhere on that subject.

'About supplies taken direct from pipelines; I am glad to see that supplies are given in this manner when practicable. This statement may surprise Mr. Hird, as he well knows how reluctant I used to be in the early days to allow this sort of thing. But my reluctance was based upon insecurity of supply at that time, with the ever-present possibility of the danger of consumer supplies failing in the event, for instance, of a compressor at a coke oven plant failing for a short period. Supplies are much more reliable now and standby compressors are available elsewhere in the grid.'

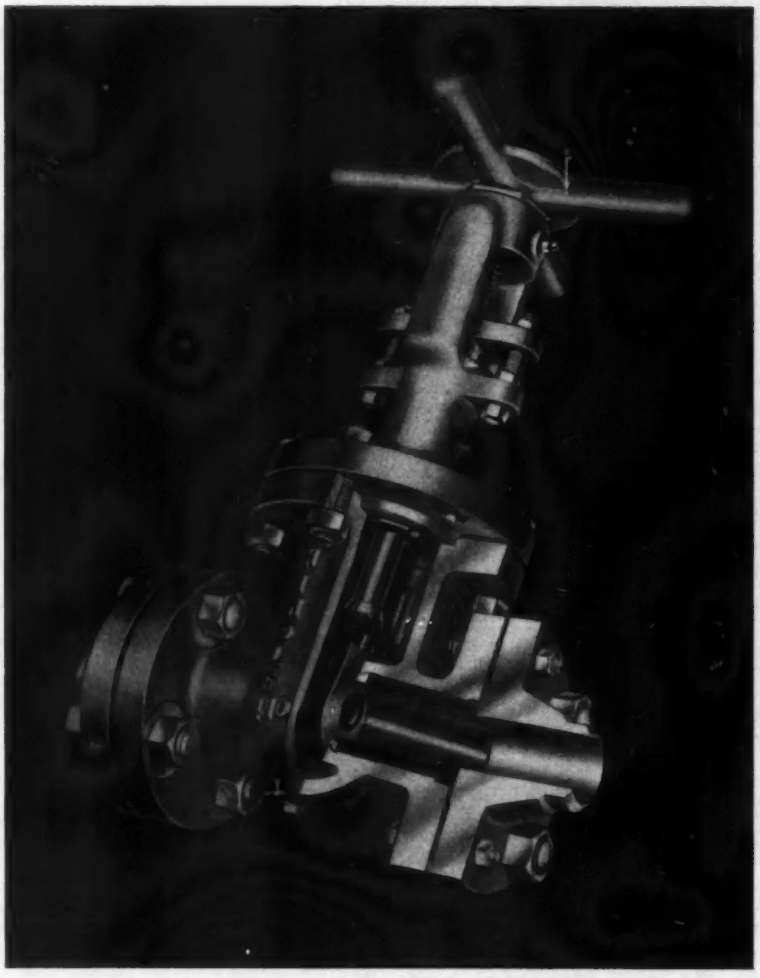
**Mr. Leslie T. Minchin,** Consultant: I am particularly interested in the methane drainage aspect, because I have been conducting some mild propaganda for this for some seven or eight years now, and it is extremely gratifying to see that at last the gas industry is making use of fire damp on a considerable scale, and even more reassuring to see that the Wales Gas Board may be getting 15 mill. cu.ft. a day in the future.

## Methane link-up

'The essence of methane drainage utilisation is, of course, that you should have three or four, or more, collieries linked up by a main in order to ensure realibility of supply. Since the output of methane depends so much upon the rate of winning of coal and other factors, one can only get a reliable supply by having a connection to a number of coal mines. I see that in the Port Talbot region there are three mines linked up now. It will be a very good thing if more of that can be done.

'We are still dreadfully behind one or two other countries in Europe, especially Belgium, where the South Belgian coalfield has thirty coal mines linked up into a methane grid. One of the handicaps which we have in this country—I do not know whether everyone here will agree with me—is that we have not got any pipe-line companies, as in Belgium, which can go out to get gas from wherever it is available and transport it and sell it to the person who wants it.

'There is one form of application of fire damp which does not seem to have taken place in this country at all yet, and that is the use of fire damp for the firing of coke ovens. This is one of the best ways of utilising fire damp in many respects, because, in so far as you release coke oven gas which would otherwise be used for firing, you are in fact doing a conversion from fire damp, which is not quite like town gas, to a perfectly straight coal gas without any loss of efficiency in the conversion, and you have the advantage then that if you do want an urgent peak load you can perhaps replace the methane firing by producer gas.



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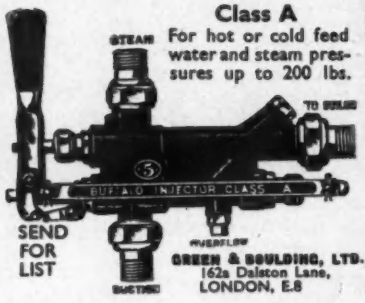


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**APPLICATIONS are invited for the position of** STORES SUPERINTENDENT in the Divisional Sales and Service Stores in Sheffield, which are in course of establishment.

Salary will be within Grades A.P.T. 11/12 (£946/£1,131) the point of entry being determined by the qualifications and experience of the person appointed.

Duties will involve responsibility, under the Divisional Stores and Purchasing Officer for the build-up, control and operation of a large Sales and Service Stores covering some 400,000 consumers and later also for an adjacent Distribution Stores serving the Divisional Main and Service Laying Department.

Applicants must be experienced in large scale Stores operation and control with a sound knowledge of modern handling and storage methods and Stores records systems.

The position is pensionable and the successful applicant will be required to pass a medical examination.

Applications, giving age, full details of qualifications, education and experience, together with the names and addresses of two referees, should be addressed to the undersigned to be received by him not later than June 30, 1959.

C. C. WOOD,
Divisional General Manager.

Commercial Street,
Sheffield.

### EAST MIDLANDS GAS BOARD
NOTTS. & DERBY DIVISION

DEPUTY DISTRIBUTION ENGINEER—DERBY DISTRICT

**APPLICATIONS are invited from suitably qualified** persons for the above position at a salary within Grade A.P.T. 9 (£827/£927). There will be scope for promotion to A.P.T. 10 (maximum £1,002) for a man who proves his ability successfully to assume greater responsibilities.

Applicants should possess the Higher Grade Certificate (Supply) of the Institution of Gas Engineers or an equivalent qualification and should be experienced in all branches of gas distribution at both low and high pressures.

The position is pensionable and the successful applicant may be required to pass a medical examination.

Applications stating age and experience, giving full particulars of training and qualifications, together with the names of two referees, should be submitted to the undersigned not later than June 26, 1959.

K. L. PEARCE,
Divisional General Manager.

East Midlands Gas Board,
Notts. and Derby Division,
P.O. Box No. 62,
Friar Gate,
Derby.

### EAST MIDLANDS GAS BOARD
LEICESTER AND NORTHANTS DIVISION

LEICESTER GROUP
FIRST CLASS GAS FITTER

**FIRST Class Gasfitter required at the Loughborough** (Leicestershire) Undertaking. Rate of pay 4s. 11d. per hour. Accommodation available at reasonable rent. Applications giving age, qualifications and experience to reach Divisional General Manager, Millstone Lane, Leicester, not later than June 30, 1959.

### EAST MIDLANDS GAS BOARD
ENGINEERING & PRODUCTION DEPARTMENT
WORKS CHEMIST, TANNER STREET WORKS, NORTHAMPTON

**APPLICATIONS are invited from suitably qualified** persons for the above post at Tanner Street Works, Northampton. The appointment will be made within Grades A.P.T. 8/9 (£773/£927) of the National Salary Scales for Gas Staffs.

Candidates should desirably be in possession of the Higher National Certificate in Chemistry or equivalent qualification. Previous chemical experience in a Gasworks is essential.

The position is pensionable and the successful applicant will be required to pass a medical examination.

Applications stating age, experience and qualifications, together with the names and addresses of two referees should be addressed to reach the undersigned by not later than July 6, 1959.

A. GWYNNE DAVIES,
Secretary.

Beverley House,
University Road,
Leicester.

### WEST MIDLANDS GAS BOARD
WOLVERHAMPTON & DISTRICT DIVISION

CHIEF DRAUGHTSMAN
DIVISIONAL DRAWING OFFICE

**APPLICATIONS are invited from suitably qualified** persons for the above post.

Candidates must have knowledge of the design and construction of gasworks plant and foundations, be experienced in the preparation of large schemes and specifications and should preferably have been in control of a Drawing Office.

The successful candidate will be responsible to the Divisional Engineer for the preparation of schemes relating to all new plant and modifications to existing plant throughout the Division, and will also be concerned with the installation and the erection of all new plant.

The salary for the appointment, which is pensionable and subject to medical examination, will be within A.P.T. Grade 12 (£1,006-£1,131 per annum) of the National Salary Scales for Gas Staffs.

A house or bungalow may be available, if required.

Applications, stating age, qualifications and experience, together with the names of two referees, should be adressed to Mr. Stanley Jones, Divisional General Manager, West Midlands Gas Board, Kensington House, Bath Street, Dudley.

J. SWAN,
Secretary to the Board.

### WEST MIDLANDS GAS BOARD
WARWICKSHIRE DIVISION

VACANCY FOR
ASSISTANT DIVISIONAL SALES AND SERVICE OFFICER

**CANDIDATES should have had wide experience** in selling, and be capable of implementing special sales campaigns.

The person appointed will be responsible, under the Divisional Sales and Service Officer, primarily for the sales and service activities at Coventry District, but he will also be required to carry out certain Divisional duties.

The salary for the appointment, which is pensionable and subject to medical examination, will be within Grade 12 (£1,006-£1,131 per annum) of the National Salary Scales for Gas Staffs.

Applications, giving details of age, education and experience, together with the names of two referees, should be addressed to Mr. A. Allen, Divisional General Manager, West Midlands Gas Board, Gas Street, Coventry.

J. SWAN,
Secretary to the Board.

### DEVELOPMENT MANAGER

CHEMICALS SALES

**THE National Coal Board are major producers of** chemical by-products. Due to an impending retirement, a vacancy arises for Head of the By-Products Branch in the Marketing Department at their London Headquarters.

The post calls for a knowledge of Tar, Benzole and Ammonia products for the home and export markets, and for practical experience in sales development and the conduct of market surveys.

Besides this knowledge and experience, the successful applicant is likely to possess a degree, possibly a higher degree, in chemistry or chemical engineering and to be between 40 and 50 years of age. He will be a man capable of representing the Board within the trade.

There are attractive conditions of service, including superannuation. The salary could be up to £3,000 per annum.

Applications should reach the Headquarters' Staff Manager, Hobart House, Grosvenor Place, S.W.1, not later than June 29, 1959. They should be marked (X.1429/2G).

### NATIONAL CARBONISING COMPANY LIMITED

MANUFACTURERS OF REXCO SMOKELESS COAL

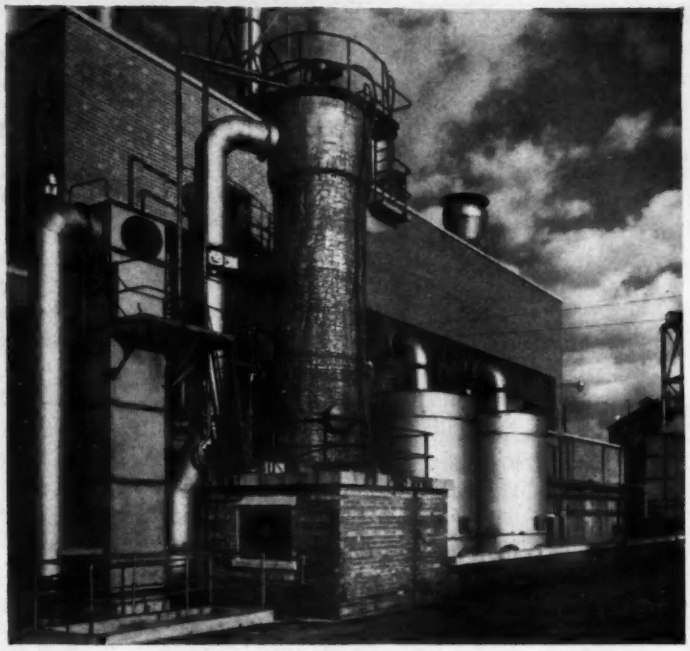
TECHNICAL SALES REPRESENTATIVE
INDUSTRIAL BURNING OF COKE SMALLS

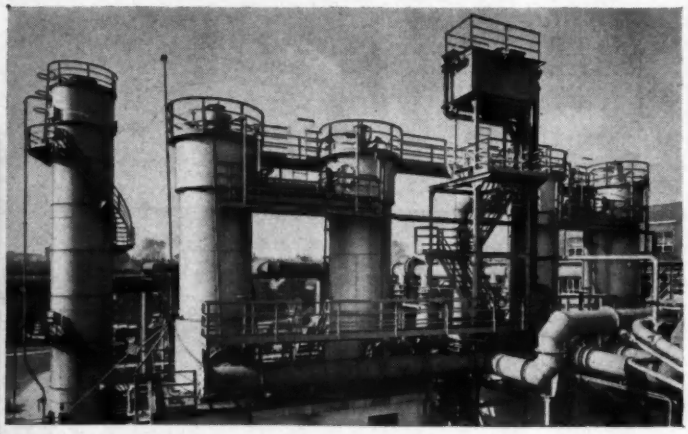
**APPLICANTS wishing to apply for the above position** of TECHNICAL SALES REPRESENTATIVE must hold suitable technical qualifications and also have practical experience of the industrial burning of coke smalls.

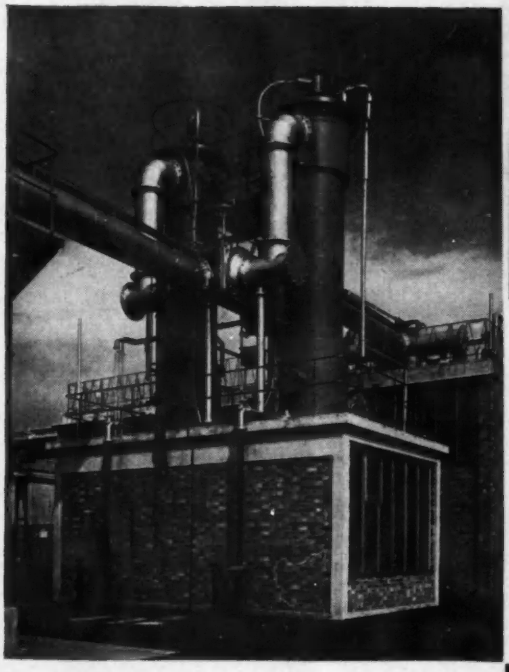
The vacancy which is superannuated carries a commencing salary of between £1,000/£1,250 per annum. Car provided for successful applicant.

Detailed applications, which will be held in confidence, should be addressed to the General Manager, 14, Woodhouse Road, Mansfield, Notts.

# Holmes-Elex Electrical Detarrers







*Top*—A Holmes-Elex Electrical Detarrer installed after a carburetted water gas plant at the Lostock Hall Works, Preston, of the North Western Gas Board. Installed to the order of Messrs. Humphreys & Glasgow Ltd.

*Centre*—Two 9 million cu. ft. per day Holmes-Elex Electrical Detarrers cleaning carburetted water gas, and two 6·5 million cu. ft. per day units cleaning coal gas at the Pleck Works, Walsall, of the West Midlands Gas Board.

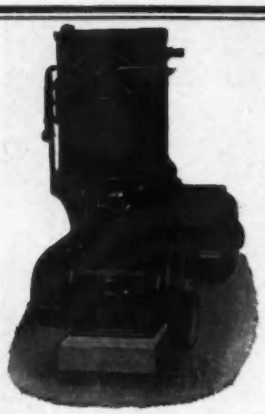
*Left*—Two 3 million cu. ft. per day Holmes-Elex Electrical Detarrers installed at the White Lund Works, Morecambe, of the North Western Gas Board.

W. C. HOLMES & CO. LTD.

Gas Cleaning Division, Turnbridge, Huddersfield

Telephones: Huddersfield 5280
Birmingham: Midland 6830
London: Victoria 9971

CA94

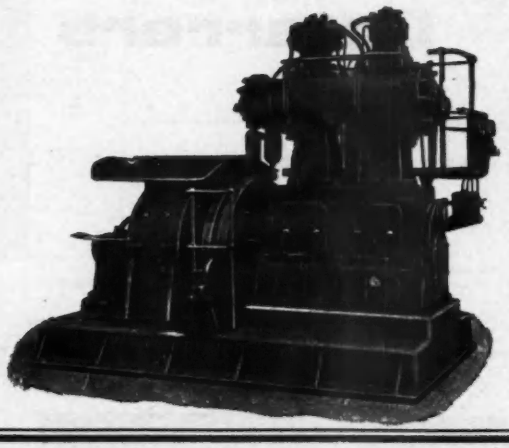


# HIGH PRESSURE GAS COMPRESSORS *for*

## *pressures up to 5,000 lbs. per sq. in.*

The illustrations show two high pressure gas compressors. As specialists in the design and manufacture of compressors for both air and gases, we make compressors for a wide range of capacity and pressure up to 5,000 lbs. per sq. inch.

The compressor shown above has a capacity of 25 cu. ft. of free hydrogen per minute compressed to 3,000 lbs./sq. inch. The illustration on the right shows a four-stage compressor with a delivered capacity of 200 cu. ft. of free town's gas per minute compressed to 5,000 lbs. per sq. inch.



*For full information regarding gas compressors, write, giving particulars of the duty required, to—*

**REAVELL & CO., LTD.**

**RANELAGH WORKS, IPSWICH**

Telegrams: "REAVELL, IPSWICH." Phone No. IPSWICH 56124 (3 lines)

# *STEEL* SHELVING

**72 in. HIGH**
**34 in. WIDE**
**12 in. DEEP**

- *Brand new—Manufactured in our own works.*
- *Shelves adjustable every inch.*
- *Heavy gauge shelves will carry 400 lb. each.*
- *Stove enamelled dark green.*
- *6 shelves per bay—Extra shelves 8/- each.*
- *Quantity discounts.*

**Ready for erection £3 15s.**

**Delivered free to England, Scotland and Wales**

**N. C. BROWN LTD.**

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**HEYWOOD · LANCS**

***—the manufacturers***

Also available in White at £5 per bay.

ALL OTHER SIZES available at equally keen prices.

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Mild Steel Flanges and Blanks profile cut and drilled to standard and special specifications.

All types of ducting and pipework up to ½" thick wall.

Machining capacity available including turning up to 5' 6" diameter.

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REF. No. IND/FB/89

# HUWOOD Conveyors

*In growing demand in the GAS and allied Industries*

The best form of short distance transport

HUGH WOOD & CO. LTD.

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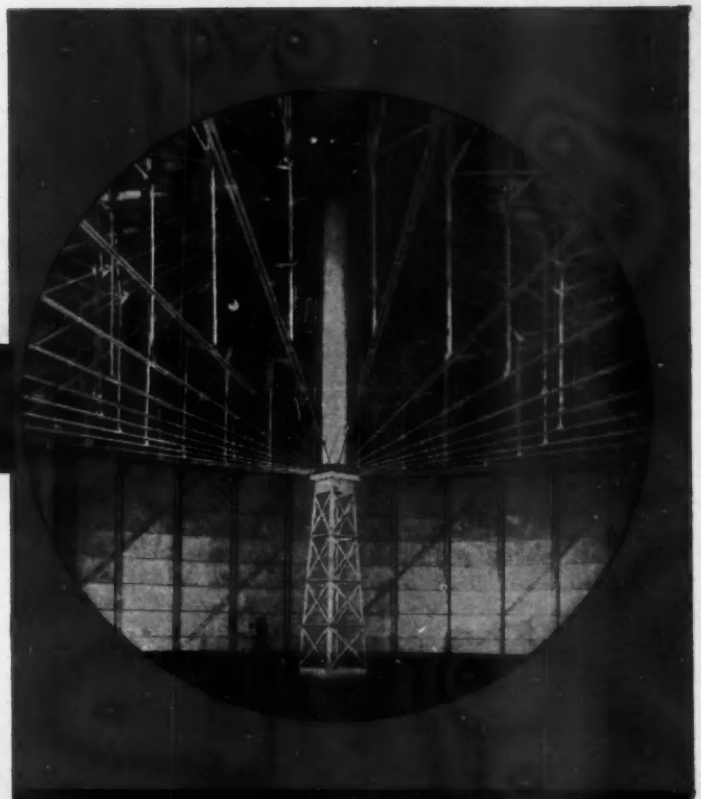
Telegrams: Huwood Stock, London. Telephone: Monarch 3273 (4 lines).



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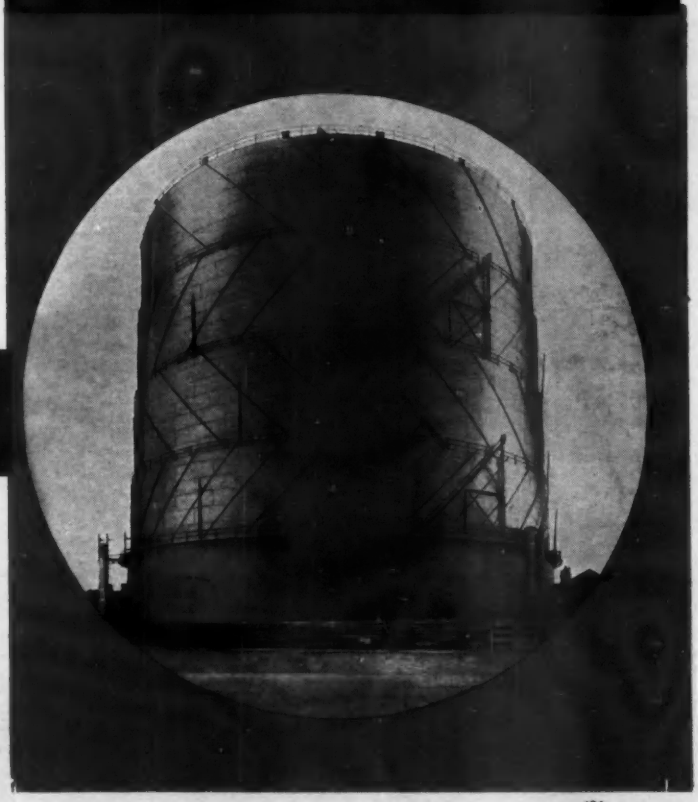
**welded design . . .**



*Gasholders*

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406